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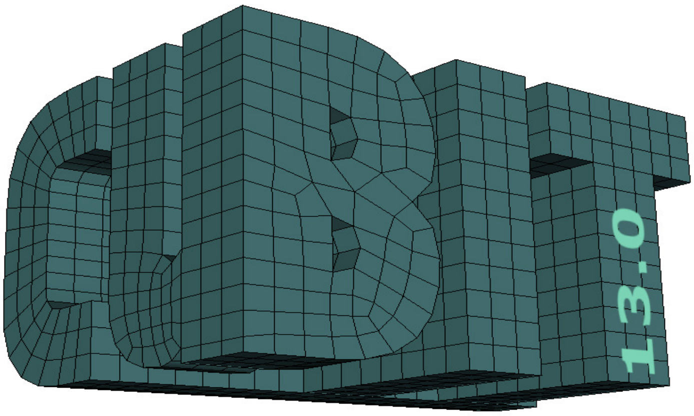


CUBIT 13.0 Release Notes

Released March 2011

Product Description

CUBIT is a full-featured software toolkit for robust generation of two- and three-dimensional finite element meshes (grids) and geometry preparation. Its main goal is to reduce the time to generate meshes, particularly large hex meshes of complicated, interlocking assemblies.

Product Highlights

Meshing: CUBIT is a solid-modeler based preprocessor that meshes volumes and surfaces for finite element analysis. Mesh generation algorithms include quadrilateral and triangular paving, 2D and 3D mapping, hex sweeping and multi-sweeping, tet meshing, and various special purpose primitives. CUBIT contains many algorithms for controlling and automating much of the meshing process, such as automatic scheme selection, interval matching, sweep grouping and sweep verification, and also includes state-of-the-art smoothing algorithms.

Geometry Preparation: One of CUBIT's strengths is its ability to import and mesh geometry from a variety of CAD packages. CUBIT currently integrates the ACIS, Granite, and Catia geometry kernels directly within its code base, allowing direct manipulation of the native CAD geometry format within CUBIT. This reduces the errors and anomalies so often associated with geometry translation. CGM also boasts a facet-based geometry kernel developed at Sandia that can be used for remeshing or editing old mesh files or models defined by triangle facets. In addition, CUBIT has developed a comprehensive virtual geometry capability that permits local composites and partitions to geometry without modifying the underlying native geometry representation. The user can choose to ignore, clean-up or add features to the model allowing greater flexibility to meshing algorithms to generate better quality elements.

CUBIT Environment: CUBIT has developed both a convenient command line interface with an extensive command language as well as a polished graphical user interface environment. The GUI is based upon the cross-platform standard QT, which allows the same look and feel on all supported platforms. Also included is a graphical environment based upon the VTK graphics standard which has been optimized for display and manipulation of finite element data and geometry. Fast, interactive manipulation of the model is a tremendous advantage for models with thousands of parts or millions of elements.

For more information on CUBIT, including licensing arrangements and terms see the CUBIT website http://cubit.sandia.gov

New Features in CUBIT 13.0

Breakpad

Cubit 13.0 now implements Google Breakpad to track crashes that occur in Cubit. This new feature sends information on where Cubit crashed within its code. We then use the information to make Cubit more stable.

(Back to New Features)

Instrumentation

Along with the usage statistics, Cubit 13.0 will gather types of functionality used to allow the team to understand what parts of Cubit are used. This will help the team to know where they need to focus their efforts in making Cubit a better product. As with the usage statistics tracking, the user can turn off this capability.

(Back to New Features)

Acis Upgrade

Cubit 13.0 has upgraded its Acis geometry engine to the most recent version, R21. With this upgrade, the geomtery engine has bug fixes and enhancements to improve Cubit. As usual, there is a possibility that the upgrade will result in changes to journal IDs.

(Back to New Features)

New Command to View Duplicate Block Elements

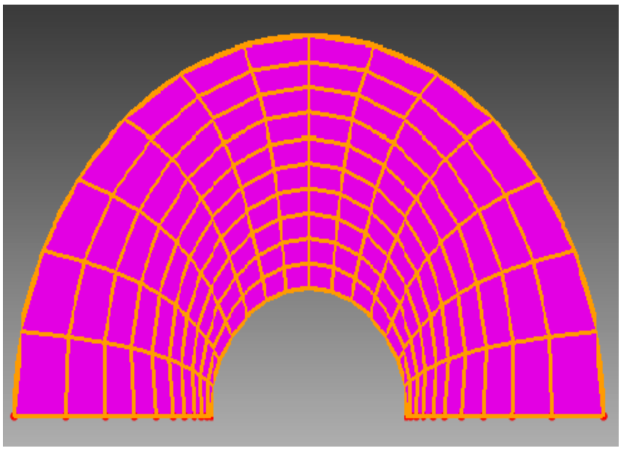
Cubit 13.0 now gives an option to allow elements to be included in more than one block. The default behavior is to prevent any given element from being included in more than one block. The following command shows how to turn this option on. However, since material properties are assigned to blocks, using this command to allow duplicate block elements may result in an element being assigned to multiple materials.

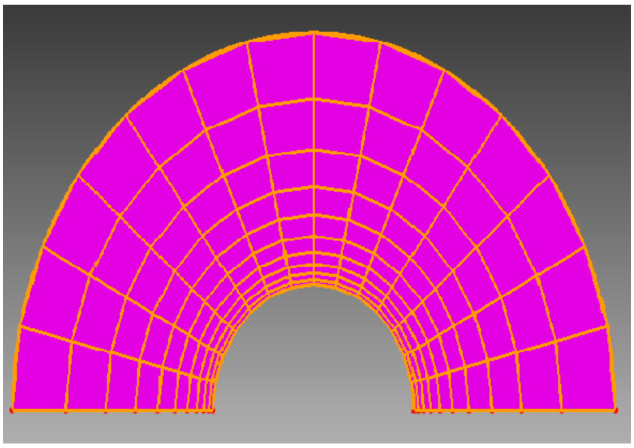
```
     Set Duplicate Block Elements {on|OFF}
```

(Back to New Features)

Improved Mapping in Presence of Bias

In previous versions, some bias would skew mapped surfaces and volumes. Mapping with a bias now acts as expected. Below are examples of previous versions (on the left) and Cubit 13.0 (on the right).





(Back to New Features)

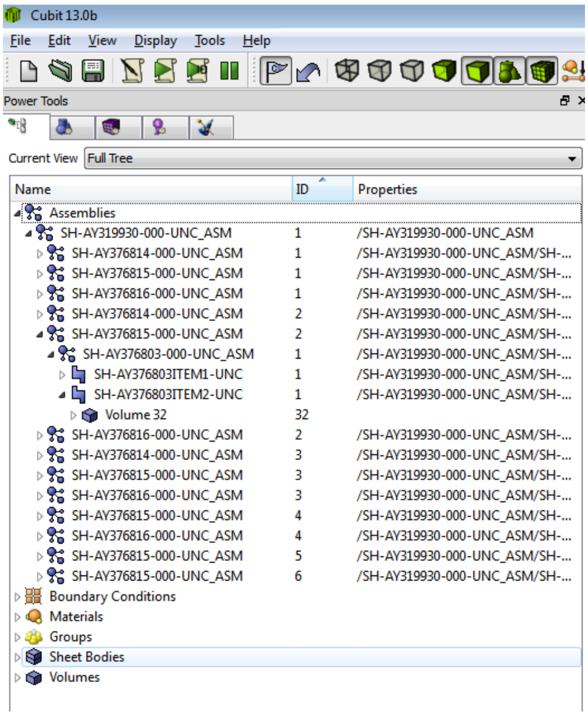
Volume Mapper Memory Improvements

Improvements have been made to the Volume Mapper in Cubit 13.0 and is now 2-3 times faster than version 12.2. Also, the Volume Mapper now uses half of the memory compared to older versions.

(Back to New Features)

Import Part/Assembly from STEP

Beginning with version 13.0, Cubit will read assembly information embedded in the imported STEP file. No additional arguments are required. The resultant assembly/part structure will be displayed in the GUI's main entity tree, as shown in the example below.



Current View Full Tree

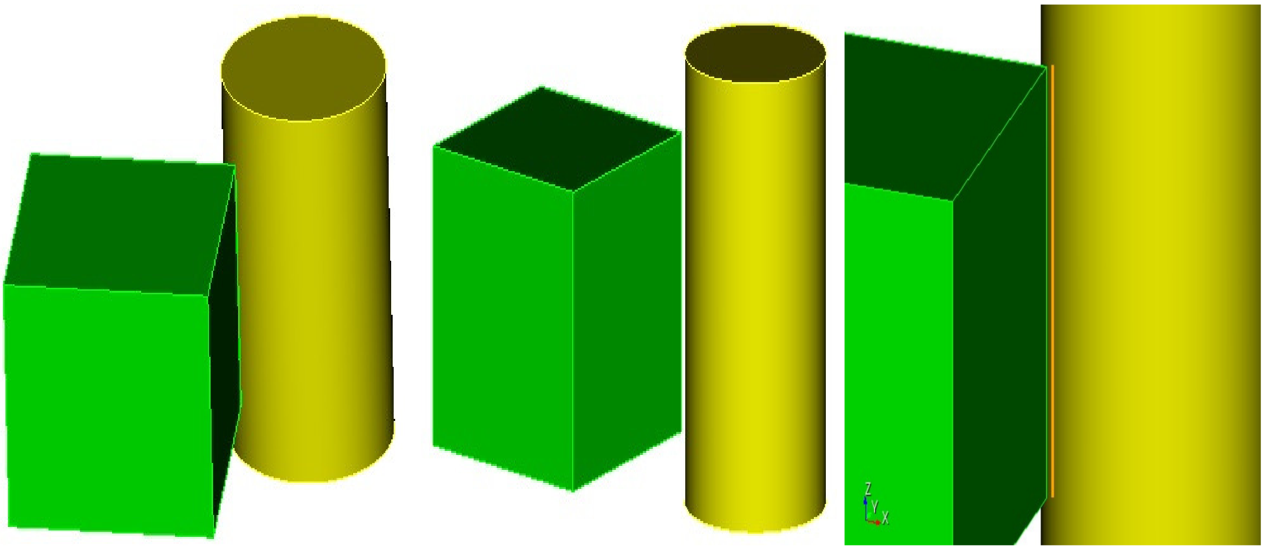
Name	ID	Properties
Assemblies		
SH-AY319930-000-UNC_ASM	1	/SH-AY319930-000-UNC_ASM
SH-AY376814-000-UNC_ASM	1	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	1	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376816-000-UNC_ASM	1	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376814-000-UNC_ASM	2	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	2	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376803-000-UNC_ASM	1	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376803ITEM1-UNC	1	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376803ITEM2-UNC	1	/SH-AY319930-000-UNC_ASM/SH-...
Volume 32	32	
SH-AY376816-000-UNC_ASM	2	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376814-000-UNC_ASM	3	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	3	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376816-000-UNC_ASM	3	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	4	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376816-000-UNC_ASM	4	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	5	/SH-AY319930-000-UNC_ASM/SH-...
SH-AY376815-000-UNC_ASM	6	/SH-AY319930-000-UNC_ASM/SH-...
Boundary Conditions		
Materials		
Groups		
Sheet Bodies		
Volumes		

(Back to New Features)

Tolerant Imprinting Handles 'T' Junctions

Cubit's tolerant imprinting feature can now handle non-manifold junctions (such as 'T' junctions) in version 13.0. The merge tolerance set by the user is used while imprinting 'T' junctions. Below is an example of tolerant imprinting done with the edge of a brick on a surface of a cylinder. The highlighted line in the right picture shows where the two volumes successfully imprinted. The commands associated with tolerant imprinting are also shown below.

```
Imprint Tolerant {Body|Volume} <range>

Imprint Tolerant Surface <id> with Curve <id_range> [merge]

Imprint Tolerant Surface <id> <id> with Curve <id_range> [merge]
```



(Back to New Features)

More Robust Overlap Checks in Tolerant Imprinting

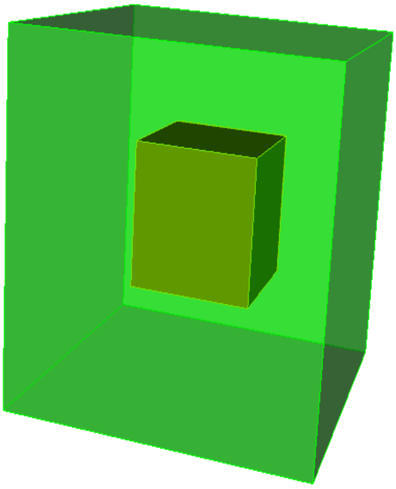
With various bug fixes and enhancements made to the tolerant imprinting code, the overlap check for tolerant imprinting is now more robust with Cubit 13.0.

(Back to New Features)

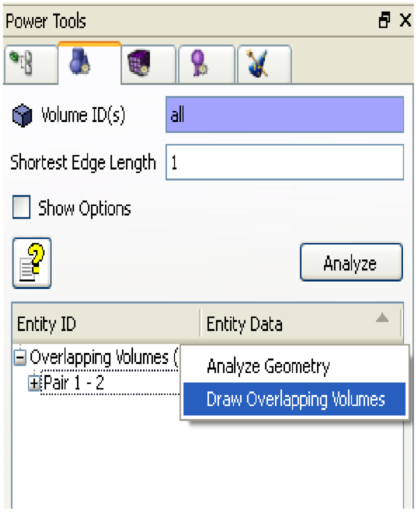
Volume Overlap Visualization

The overlapping region between two volumes may be drawn with the following command. This allows you to be able to quickly identify overlapping volumes that may affect your ability to mesh the model. The command below will draw the input volumes in transparent mode and draw the volume(s) of intersection as red, shaded solids. The Add keyword will draw the results on top of the current graphics display. Without the Add keyword, the display will only show the specified volumes along with the intersection volume(s).

```
     Draw Volume <id> <id> Overlap [Add]
```



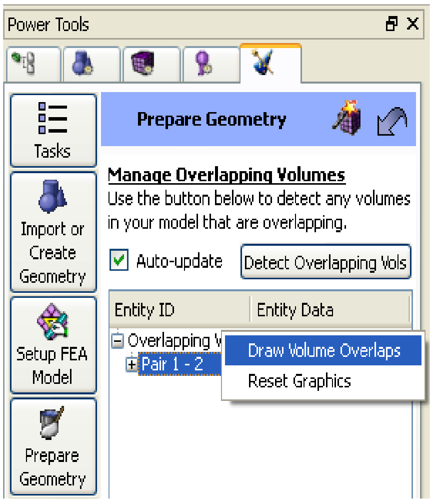
There are two ways to access this feature from the GUI. The first place it is located in is the Geometry Power tool (as seen below on the left). The second place is in the ITEM tool (as seen on the right) in the "Prepare Geometry" step. To visualize the overlapping volumes for both methods, right-click on a specific pair and select "Draw Volume Overlaps."



Volume ID(s): all

Shortest Edge Length: 1

□ Show Options



Prepare Geometry

Manage Overlapping Volumes

Use the button below to detect any volumes in your model that are overlapping.

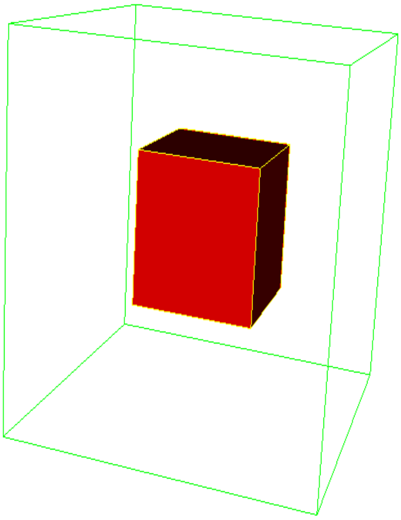
☑ Auto-update

(Back to New Features)

Preview Option in Intersect Volume Command

The following command can also be used to identify overlapping volumes. The computed intersecting volumes will be drawn as red, shaded solids. For best results, change the graphics mode to transparent or wire frame mode so the intersection is visible. Otherwise, the intersection volume will be hidden by the volumes being intersected.

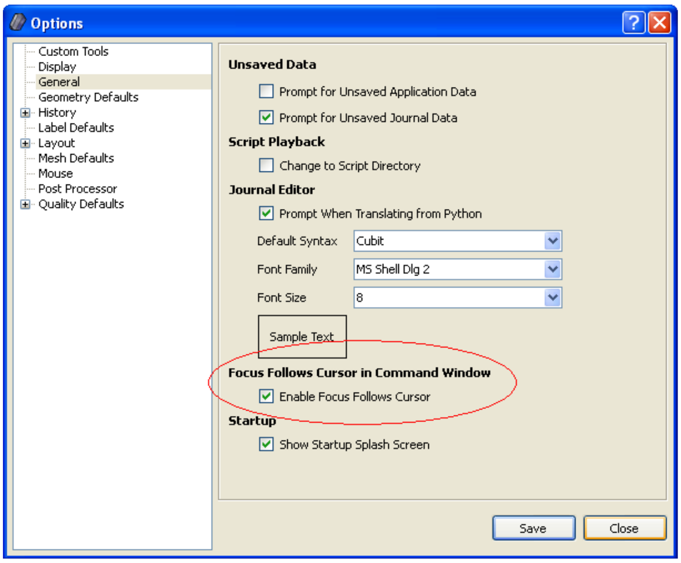
```
    Intersect {Volume|[Body]} <range> [With {Volume|[Body]} <range>] [Keep] [Preview]
```



(Back to New Features)

Focus Follows Cursor Option

The new focus follows cursor option can be set from the Tools/Options/General menu (see below). The focus to type text will automatically turn to the command line panel when the mouse falls in the command line window. The focus follows cursor option allows the focus to snap to the command line, ready for you to type when the mouse falls within Command Line panel. With the option on, you won't have to click in the Command Line Panel to begin typing. If the mouse is in the panel, then you can start typing automatically. This function only works with the Command Line Panel.



Unsaved Data

□ Prompt for Unsaved Application Data

☑ Prompt for Unsaved Journal Data

Script Playback

□ Change to Script Directory

Journal Editor

☑ Prompt When Translating from Python

Default Syntax: Cubit

Font Family: MS Shell Dlg 2

Font Size: 8

Sample Text

Focus Follows Cursor in Command Window

☑ Enable Focus Follows Cursor

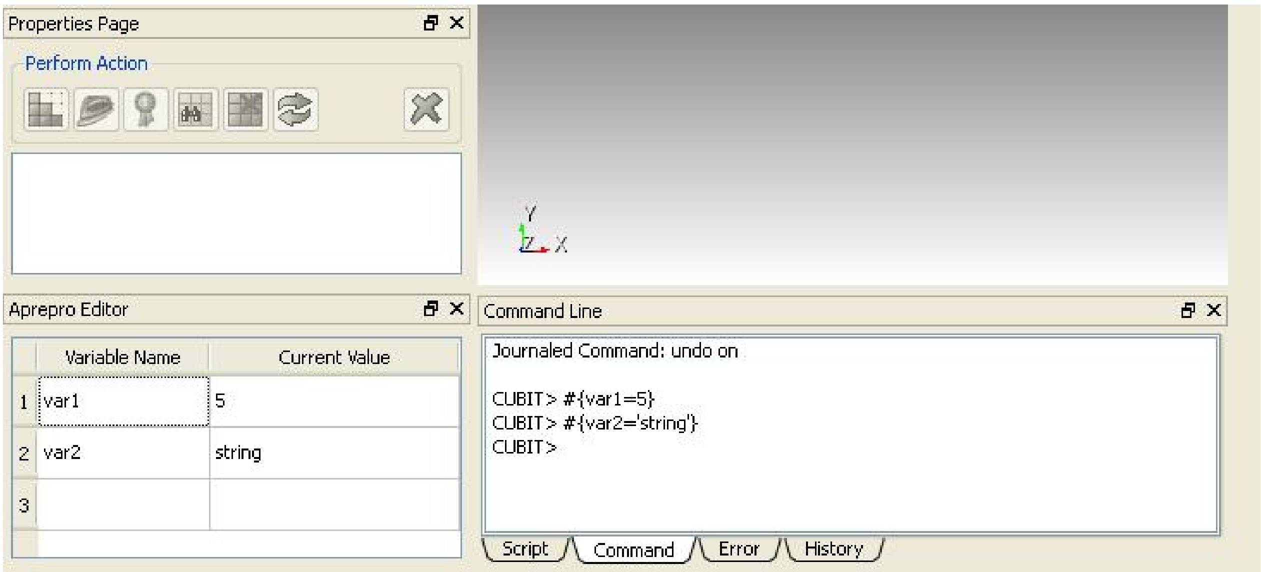
Startup

☑ Show Startup Splash Screen

(Back to New Features)

Aprepro Editor

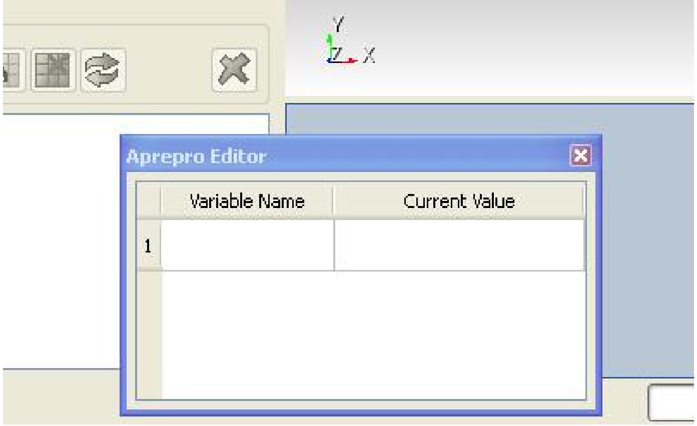
Cubit 13.0 now includes an Aprepro Editor within the GUI. To create a variable, start typing the name in the Variable Name column and the content of the variable in the Current Value column. When the variable has been set, the Aprepro command is displayed in the Command Line. Likewise, if a variable is changed on the command line, the Aprepro Editor updates to display the current value. The editor also automatically recognizes if it is a string or numeric variable.



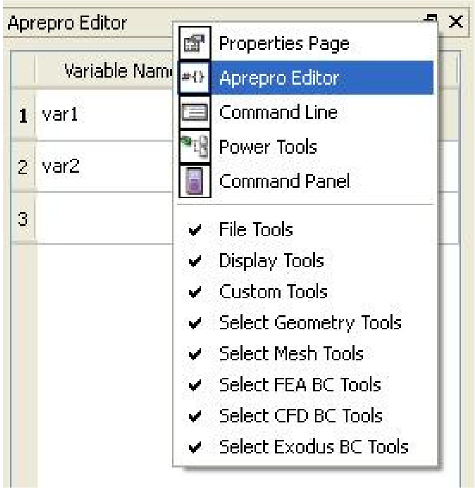
	Variable Name	Current Value
1	var1	5
2	var2	string
3		

```
Journaled Command: undo on

CUBIT> #{var1=5}
CUBIT> #{var2='string'}
CUBIT>
```

The default location for the new Aprepro Editor in Cubit 13.0 is under the Properties Page in the lower, left-hand corner. Like all of the panels in the Cubit GUI, the Aprepro Editor can be docked in another location on the GUI or undocked from the GUI. To do so, click the title of the panel and drag the panel to the desired location. An example of docking is shown below. The editor can also be turned off by right-clicking any panel to display the View Menu, as shown below.



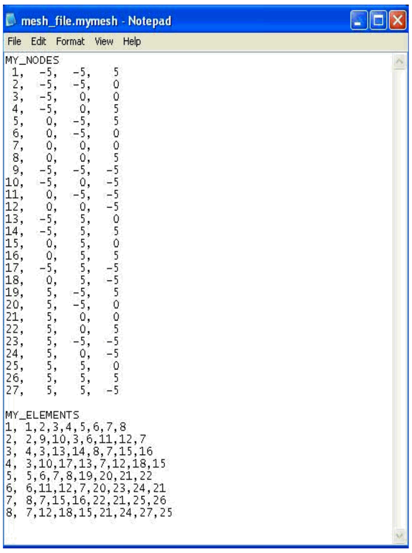
	Variable Name	Current Value
1		



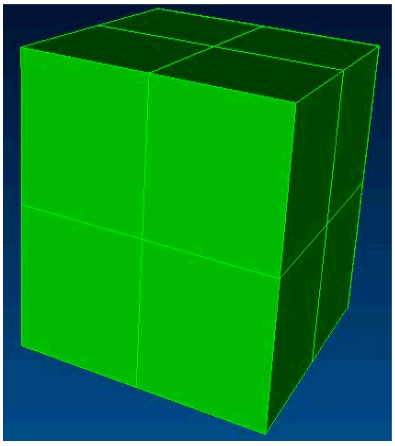
(Back to New Features)

Python Mesh Import Interface

Cubit 13.0 includes a feature that will allow users to use Python to import any mesh format into Cubit. This new Python interface supports nodes, elements, blocks, sidesets, and nodesets. An example of a generic, "homemade" mesh file and the mesh created by Cubit is shown below.



```
MY_NODES
 1,  -5,  -5,   5
 2,  -5,  -5,   0
 3,  -5,   0,   0
 4,  -5,   0,   5
 5,   0,  -5,   5
 6,   0,  -5,   0
 7,   0,   0,   0
 8,   0,   0,   5
 9,  -5,  -5,  -5
10,  -5,   0,  -5
11,   0,  -5,  -5
12,   0,   0,  -5
13,  -5,   5,   0
14,  -5,   5,   5
15,   0,   5,   0
16,   0,   5,   5
17,  -5,   5,  -5
18,   0,   5,  -5
19,   5,  -5,   5
20,   5,  -5,   0
21,   5,   0,   0
22,   5,   0,   5
23,   5,  -5,  -5
24,   5,   0,  -5
25,   5,   5,   0
26,   5,   5,   5
27,   5,   5,  -5

MY_ELEMENTS
1, 1,2,3,4,5,6,7,8
2, 2,9,10,3,6,11,12,7
3, 4,3,13,14,8,7,15,16
4, 3,10,17,13,7,12,18,15
5, 5,6,7,8,19,20,21,22
6, 6,11,12,7,20,23,24,21
7, 8,7,15,16,22,21,25,26
8, 7,12,18,15,21,24,27,25
```



(Back to New Features)

New Meshed Based Geometry Engine

The Mesh Based Geometry engine has been greatly improved. The commands that have the "geometry" keyword now generate non-manifold curves and surfaces where indicated by nodesets and sidesets. Also for the Cubit 13.0 release, the "Import mesh geometry..." and "Create mesh geometry..." commands are significantly faster and are also able to handle non-manifold geomtry.

(Back to New Features)

Constraints

Cubit 13.0 now supports constraint boundary conditions. Constraints couple the motion of a set of nodes to the motion of a reference node. Rigid bodies and kinematic constraints do exactly this for blocks and sidesets, respectively. A distributing constraint allows users to average the constrained motion of a sideset by using weight factors to control force transmission (to be specified outside of CUBIT).

Constraints are supported only by the Abaqus Importer/Exporter for Cubit 13.0. Contact the CUBIT support team if support in additional file formats is needed.

To create a constraint, use one of the following commands:

```
Create Constraint {Kinematic|Distributing} [name '<name>'] [vertex|node] <id>
sideset <id>

Create Constraint Rigidbody [name '<name>'] [vertex|node] <id> block <id>
```

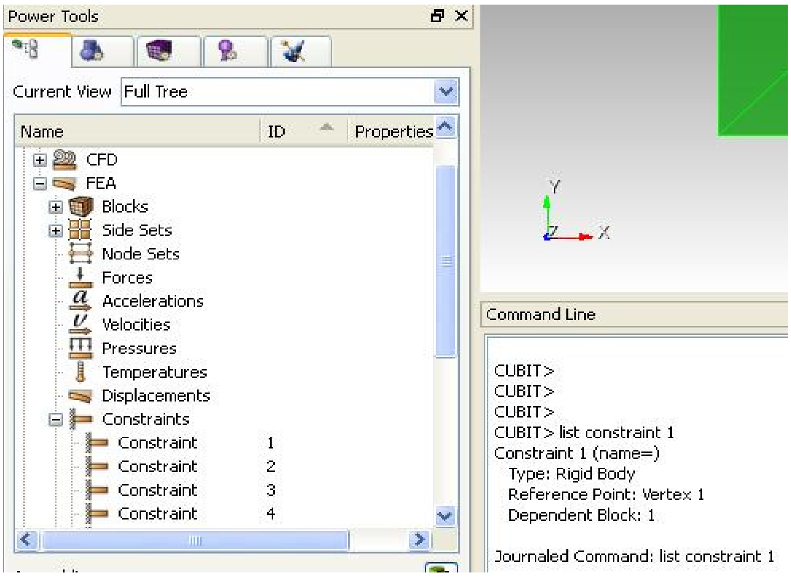
A constraint's name, dependent object, and independent object can be changed using the following commands:

```
Modify Constraint <id|name> [name '<name>'] [vertex|node] <id> sideset <id>

Modify Constraint <id|name> [name '<name>'] [vertex|node] <id> block <id>
```

Constraints can be listed or deleted using the following commands:

```
List Constraint <id_range>

Delete Constraint <id_range>
```

Constraints can also be found in the tree under the section Boundary Conditions and FEA in the Power Tools. Actions performed in the tree are reflected in the command line, as shown below.



```
CUBIT>
CUBIT>
CUBIT>
CUBIT> list constraint 1
Constraint 1 (name=)
   Type: Rigid Body
   Reference Point: Vertex 1
   Dependent Block: 1

Journaled Command: list constraint 1
```

(Back to New Features)

Beta Features

Cubit remains an active development platform for cutting-edge methods in geometry preparation and mesh generation. Some features that are still under development may not be quite ready for release, but may be valuable in some settings. The following is a list of new beta features that have been made available in Cubit version 13.0. Their functionality is not yet complete, has not been fully tested, however in many settings the new capability may be very valuable. Your help in reporting defects and offering suggestions on these features is appreciated. To turn on or off any of the features listed below, issue the following command from the command line:

```
Set developer [on|off]
```

-

Improved Mesh Based Geometry Webcut

The improvements made to the Mesh Based Geomtry engine have significantly improved the robustness of the webcut feature for mesh based geometry.

Parallel refinement by spawning STK_adapt

For those who have access to the Sierra stk_adapt module, Cubit 13.0 supports parallel refinement. To use this feature, first create a course mesh for your model. Then using the command below, indicate the number of processors and the base filename to be used. 'Numsplit' indicates the level of refinement desired. Once the process is finished, there will be Exodus files saved in the format of 'filename.exo.t.p,' where 't' represents the total number of processors and 'p' represents the processor rank that created the file.

```
Refine Parallel [Processors <int>] [File <'filename'>] [Numsplit <int>] [Overwrite]
```

Back to New Features

Limitations in CUBIT 13.0

- As of Cubit 13.0, the Granite Geometry Kernel is no longer supported.

- The Mac OS X port does not support the changing mouse cursors on pre-selection. It is recommended that a 3-button mouse be used for the Mac OS X version since interactive transformation utilizes all three buttons.

Fixed Defects in CUBIT 13.0

The following items are the user-reported bugs fixed since last release of CUBIT (September 2010). For more information contact Tim Tafoya (tdtafoy@sandia.gov)

Ref #	Resolved Defect*
9028	Labels not working on Linux
9018	Surface normals inconsistent after tet refinement on merged surfaces
8996	Tet mesher gets stuck in infinite loop
8991	Crash on chop command
8980	Pillow Face GUI Bug

*The defects listed above are only those user-reported issues deemed "critical" or "blocker". For information on other resolved defects contact Tim Tafoya.

Known Defects in CUBIT 13.0

The following items are bugs or limitations that may be encountered in the current release of CUBIT. For more information on these defects or to report additional defects contact Tim Tafoya (tdtafoy@sandia.gov).

Ref #	Known Defects in CUBIT 13.0*	Description	Suggested Work-around
N/A			

*The defects listed above are only those user-reported issues deemed "critical" or "blocker". For information on other known defects contact Tim Tafoya.

Documentation Updates

The CUBIT 13.0 online documentation may be found at the following URL: http://cubit.sandia.gov/help-version13.0/cubithelp.htm. A PDF version is also available for download. The cubit GUI installation also includes the full user documentation included with the program. The user's manual may be accessed from the Help menu.

CUBIT 13.0 Contents of Release

Cubit Program: The installation package includes executables and libraries, packaged in tar.gz files for Linux machines. For Windows, the package is in a self-installing executable, and for Mac OS X a .dmg file is provided. Both a command line and GUI version of CUBIT are included with the installation package for all platforms.

Documentation: Linux, Windows and Mac versions include full online documentation. Windows also includes .chm (Windows Help File), of the complete documentation that can be run separately from CUBIT.

Platforms Supported

CUBIT 13.0 supports the following Platforms

- Linux RedHat Enterprise 5, 32- and 64-bit
- Windows 2000, XP, Vista, 32- and 64-bit
- Mac OS X and Intel based (universal)

Non-Sandia Users

CUBIT is available for government and academic use. For information on licensing CUBIT go to the follow URL: http://cubit.sandia.gov/licensing.html. For current CUBIT users, CUBIT 13.0 may be downloaded from the website at the following URL: http://cubit.sandia.gov/downloads.html. If you obtained a password since the release of CUBIT 10.0, your password should work for 13.0 also.

Sandia Personnel Only

Windows

Download a Windows installation file from the dropzone. Go to the following directory \\dropzone\public\cubit\Windows. Copy the file **Cubit.WindowsGUI.13.0.exe** to your windows hard drive. Double click on the file and follow the installation instructions.

MAC OS X

Download a Mac OS X disk image file from the dropzone. Go to the following directory \\dropzone\public\cubit\MAC_OS_X. Copy the file **Cubit_GUI_13.0.dmg.gz** to your Mac harddrive. Use gunzip to unpack the disk image file.

LINUX LANS

Check with your local LAN administrator for instructions on how to access CUBIT on your local LAN. In most cases typing one of the following commands at the UNIX prompt should allow you to execute CUBIT. In some cases, the full path will need to be specified:

```
/projects/cubit/<cubit_command>
```

cubit	64-bit Version 13.0 with GUI. The latest released version of CUBIT deployed to the LAN
cubit32	32-bit Version 13.0 with GUI. The latest released version of CUBIT deployed to the LAN
cubit -nogui	64-bit Version 13.0 Command Line only with graphics window
cubit -nogui -nographics	64-bit Version 13.0 Command Line only without graphics window
cubit-12.2	64-bit Version 12.2 with GUI
cubit32-12.2	32-bit Version 12.2 with GUI
cubit-beta	Version 13.0 beta. The latest beta version still in development

Contact Information

CUBIT Help

For general technical questions including download, installation and CUBIT technical assistance.

cubit-help@sandia.gov

CUBIT Licensing and Passwords

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